



Academic Skills in Computer Science (ASiCS)

II) Text Processing with Latex

II.1) Introduction to Latex

30.04.2015

Agenda

- **LaTeX – Language features and syntax**
- **BibTeX – Bibliographies for LaTeX**
- **LaTeX – Tools and compiler**

LITERATURE

- [1] Sascha Lüdecke: Einführung in LaTeX.
<http://www.meta-x.de/faq/LaTeX-Einfuehrung.html>
- [2] Sascha Frank: LaTeX Umlaute.
<http://www.namsu.de/Extra/befehle/Umlaute.html>
- [3] Manuela Jürgens, Thomas Feuerstack: LaTeX – Eine Einführung und ein bisschen mehr...
http://www.fernuni-hagen.de/imperia/md/content/zmi_2010/a026_latex_einf.pdf
- [4] Manuela Jürgens: LaTeX – Fortgeschrittene Anwendungen. Oder: Neues von den Hobbits...
http://www.fernuni-hagen.de/imperia/md/content/zmi_2010/a027_latex_fort.pdf

LATEX

Language Features and Syntax

Origins

- **TeX (Tau Epsilon Chi)** by Donald E. Knuth, 1978
 - **Open-Source** solution for layout of print media
 - Including formulas and tables
 - Available for almost **every OS**
- **LaTeX**: Frontend for TeX by Leslie Lamport in the 1980s
 - User responsible for **logical document structure** only
 - LaTeX code **translated into TeX**
 - Predefined layouts including font sizes, line distances etc.

WYSIWYG?

- LaTeX is **not a WYSIWYG-Editor** (What you see is what you get)
 - **Philosophy:** write **Content**, not Layout
 - But: many tools provide **hot updates** today
 - **Quasi-WYSIWYG**
 - Alternatively:
WYSIWYM (What you see is what you mean)-Frontends such as Lyx
- **Advantages**
 - **Platform-independent**
 - No dependencies to system fonts
 - Output is always the same
 - Generation of table of contents, bibliography, glossary, ...
 - Output is **print-ready** (e.g., PDF)

Why LaTeX?

- Today LaTeX is the **de-facto standard** for publications in science (at least in computer science)
- **Submission of papers** almost always as LaTeX files (e.g., Springer, ACM)
- Proceedings **layout and Styles** often as **LaTeX styles**

Compilation Process



- **Creation** of table of contents, bibliography etc.
requires up to three iterations for updating references!

LaTeX Syntax

- Commands start with **back slash** (\)
- Following **parameters** ([]) und **content** ({})
- **Example:**
 - `\documentclass[ngerman]{article}`

Document Structure

1. Style

- Document class (e.g., article, book, beamer (slides), ...)

2. Preamble

- Metadata such as title, author
- Package and library imports

3. Body

- Real content, structured by chapters, sections, slides etc.

Document Structure

```
\documentclass{scrartcl}
```

Style

```
\title{My first Document}
```

```
\author{John Doe}
```

```
\usepackage[english]{babel}
```

Package Imports:
Packages exist for almost each requirement. They can be found and browsed here <http://www.ctan.org/>

```
\begin{document}
```

```
\maketitle
```

```
Hello World!
```

```
Next paragraph.
```

```
\end{document}
```

Body

[1]

Sections

```
\chapter{A Chapter} % only for scrbook not for scrartcl  
\section{A Section}  
\subsection{A Subsection}  
\subsubsection{Further below}  
\paragraph{And even further}
```



1. A Chapter
1.1 A Section
1.1.1 A Subsection
Further below
And even further

Sections

```
\section{A Section}
```

1. Section

```
\section*{A Section not to be numbered}
```

Will also not appear in the table of contents.

```
\section{Next Section}
```

2. Next Section



Table of Contents

`\tableofcontents`

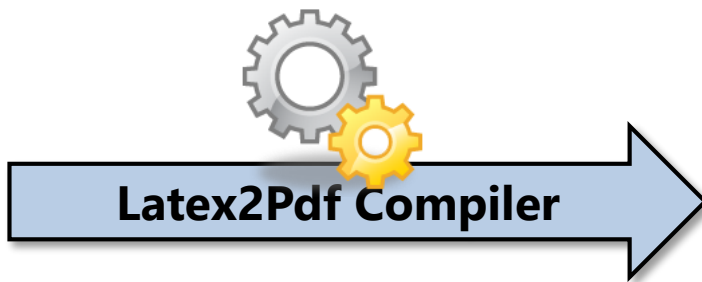


Table of Contents

1. A Chapter	1
1.1 A Section	3
1.1.1 A Subsection	5

Appendix

```
\section{A Section}
```

1. Section

```
\appendix
```

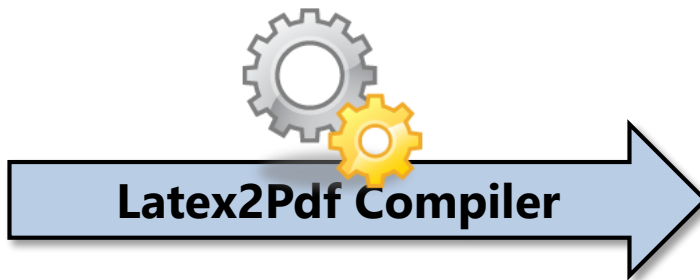
```
\section{Section in Appendix} A. Section in Appendix
```



References

```
\section{A Section}  
\label{section1}
```

This is some text with a reference to Section
`\ref{section1}`.



1.1 A Section

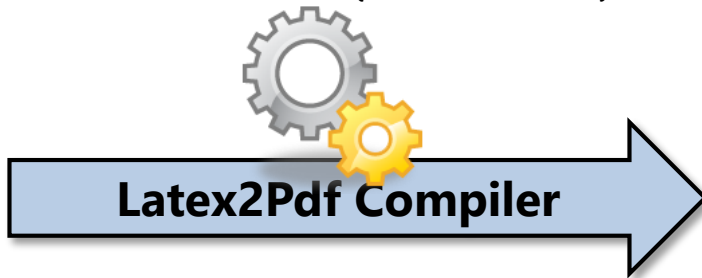
This is some text with a reference to Section 1.1.

The Tilde

- A so-called **protected white space**
- **No linebreak** allowed at this position.

This is some text with a reference to Section
`\ref{section1}`.

This is some text with a reference to
Section~`\ref{section1}`.



1.1 A Section

This is some text with a reference to Section
1.1.

This is some text with a reference to
Section 1.1.

References

Besides numbers of figures, tables, sections, ... you can also refer to **page numbers**:

See figure~\ref{fig:test} on page~\pageref{fig:test}.



See figure 1.2 on page 8.

Hyphenation

- Based on **automated algorithm**
- Can be itchy, especially for **German compound words**.

Global rules (in preamble)

```
\hyphenation{Sil-ben-tren-nung Al-go-rith-mus}
```

Local rules

<pre>\- "- "= "~</pre>	<p>Break at this position only</p> <p>Additional break at this position</p> <p>Hyphen without break</p>
------------------------	---


← Only for German documents!

```
Staats\-ver\-trag
Staats"-vertrag
Karl"=Franzensuniversität
(Haupt"~) Straße
```

Hyphenation

- Sometimes, hyphenation won't work at all:
Overfull \hbox (305.0842pt too wide) in paragraph
at lines 20--22

- Means that somewhere a word is longer than its current line:

Especially URLs are sometimes tricky when breaking to new lines: <http://www.somedomain.com/> 
You know that? Especially URLs are sometimes tricky when breaking to new lines:
<http://www.somedomain.com/> You know that? Especially URLs are sometimes tricky
when breaking to new lines: <http://www.somedomain.com/> You know that? Especially
URLs are sometimes tricky when breaking to new lines: <http://www.somedomain.com/>
You know that? Especially URLs are sometimes tricky when breaking to new lines:
<http://www.somedomain.com/>

- *% Marks overful lines with black bar.*
`\setlength{\overfullrule}{4pt}`

Font Size

`\tiny`

`\scriptsize`

`\footnotesize`

`\small`

`\normalsize` (standard)

`\large`

`\Large`

`\LARGE`

`\huge`

`\Huge`

→ You typically do not alter your **font size in** points but using these **relative sizes!**

Font Formats

```
\textrm{Roman}
```

Roman

```
\textit{Italics}
```

Italics

```
\textbf{Bold}
```

Bold

```
\textsc{Capitals}
```

CAPITALS

```
\texttt{Typewriter}
```

Typewriter

```
\textnormal{Normal}
```

Normal



Umlauts

- Umlauts must be handled especially [2]

1. Markup in text

- `\"a`, `\"o`, `\"u`, `\"A`, ... → ä, ö, ü, Ä, ...
- `\ss` → ß

2. Easier solution: package import in preamble

- `\usepackage[utf8]{inputenc}`

Enumerations

```
\begin{itemize}
  \item First
  \item Second
\end{itemize}
```

- First
- Second

```
\begin{enumerate}
  \item First
  \item Second
  \item[III] Third
\end{enumerate}
```

1. First
2. Second
- III. Third



LaTeX2PDF Compiler

Figures

```
\begin{figure} [h]
  % requires \usepackage{graphicx}
  \includegraphics [width=\textwidth]
    {bilder/bild1.pdf}
  \caption{Caption.}
  \label{bild1}
\end{figure}
```

Reference to Figure~\ref{bild1}.

Figures

```
\begin{figure} [h]
  \includegraphics [width=\textwidth]
    {pictures/bild1.pdf}
  \caption{Caption.}
  \label{bild1}
\end{figure}
```



Typical formats:
PNG, PDF

Reference to Figure~\ref{bild1}.

Figures

```
\begin{figure} [h]  
  \includegraphics [width=\textwidth]  
    {bilder/bild1.pdf}  
  \caption{Caption.}  
  \label{bild1}  
\end{figure}
```

Caption.
**Must be in front of
the label**
(otherwise the label
won't work)!

Reference to Figure~\ref{bild1}.

Figures

Width of figure (optional).
Value in cm, px, em. Also use
of variables possible:
`\textwidth`, `\columnwidth`

```
\begin{figure} [h]  
  \includegraphics [width=\textwidth]  
    {bilder/bild1.pdf}  
  \caption{Caption.}  
  \label{bild1}  
\end{figure}
```

Reference to Figure~\ref{bild1}.

Figures

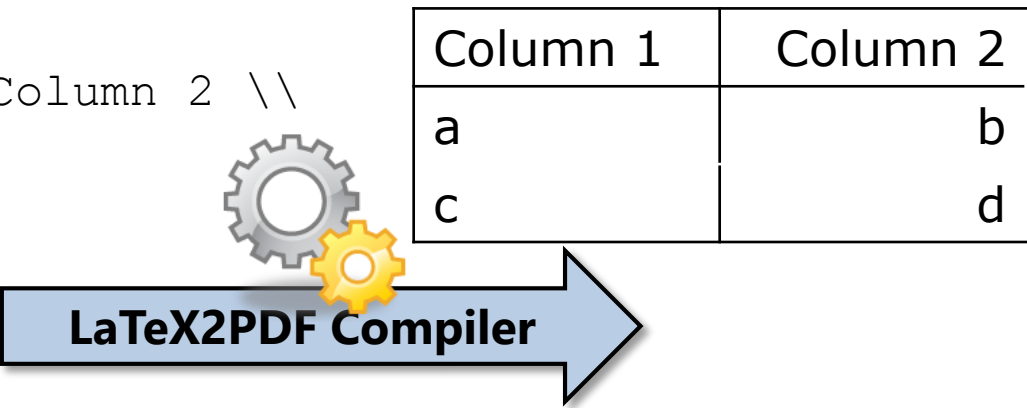
```
\begin{figure} [h]  
  \includegraphics [width=  
    {bilder/bild1.pdf}  
  \caption{Caption.}  
  \label{bild1}  
\end{figure}
```

Positioning of figure:
h = Here (in text)
t = Top (of page)
b = Bottom (of page)
p = Page (separate page)
! + position = force position

Reference to Figure~\ref{bild1}.

Tables

```
\begin{table}[h]
  \begin{tabular} { | l | r }
    \hline
    Column 1 & Column 2 \\
    \hline
    a & b \\
    c & d \\
    \hline
  \end{tabular}
  \caption{Text}
  \label{table1}
\end{table}
```



Column 1	Column 2
a	b
c	d

Tables

```

\begin{table}[h]
  \begin{tabular}{|l|}
    \hline
    Column 1 & Column 2 \\
    \hline
    a & b \\
    c & d \\
    \hline
  \end{tabular}
  \caption{Text}
  \label{table1}
\end{table}

```

Positioning

h = here in the text

t = Top (of the page)

b = Bottom (of the page)

p = Page (on separate page)

! + position = force position

a	b
c	d

Tables

```
\begin{table}[h]
  \begin{tabular} { |l|r}
    \hline
    Column 1 & Column 2 \\
    \hline
    a & b \\
    c & d \\
    \hline
  \end{tabular}
  \caption{Text}
  \label{table1}
\end{table}
```

Text Alignment:

l = left

r = right

c = centered

p{2cm} = justified with column width

c	d
---	---

Tables

```
\begin{table}[h]
  \begin{tabular} {|l|r|}
    \hline
    Column 1 & Column 2 \\
    \hline
    a & b \\
    c & d \\
    \hline
  \end{tabular}
  \caption{Text}
  \label{table1}
\end{table}
```

Vertical lines



Column 1	Column 2
a	b
c	d

Tables

```

\begin{table}[h]
  \begin{tabular} { | l | r }
    \hline
    Column 1 & Column 2 \\
    \hline
    a & b \\
    c & d \\
    \hline
  \end{tabular}
  \caption{Text}
  \label{table1}
\end{table}

```

Column 1	Column 2
	b
	d

Horizontal Lines



Tables

```
\begin{table}[h]
  \begin{tabular} { | l | r }
    \hline
    Column 1 & Column 2 \\
    \hline
    a & b \\
    c & d \\
    \hline
  \end{tabular}
  \caption{Text}
  \label{table1}
\end{table}
```

Column 1	Column 2
a	b
c	d

Column separation and Newline



Listings

```
\usepackage{lstlistings}
```

Package import in preamble!

```
\lstset{language=Java}
```

Language for syntax highlighting

```
\begin{lstlisting}[label={listI},caption={Listing  
Caption}]
```

```
public class Main {
```

```
    public static void main(String[] args) {
```

```
        System.out.println("Hello World");
```

```
    }
```

```
}
```

```
\end{lstlisting}
```

 LaTeX2PDF Compiler

Details in manual!

```
public class Main {
```

```
    public static void main(String[] args) {
```

```
        System.out.println("Hello World");
```

```
    }
```

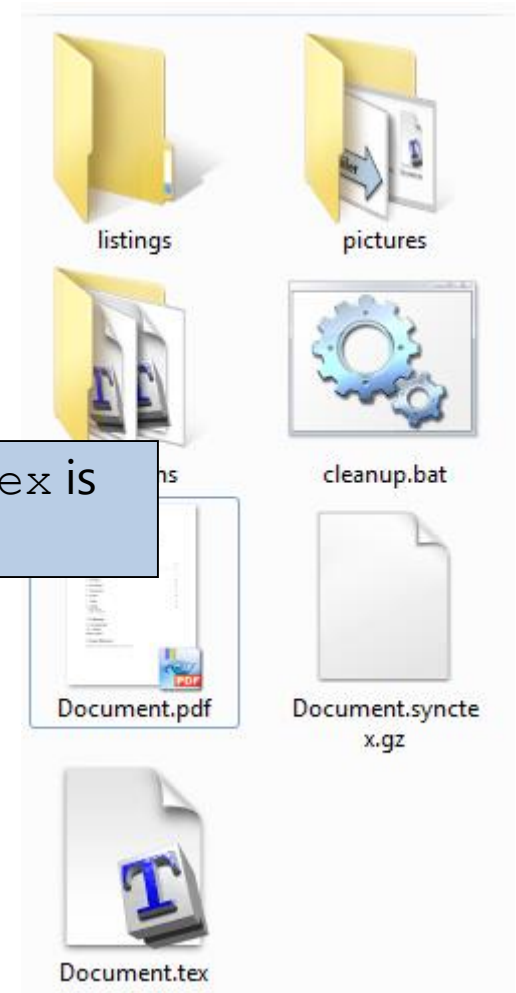
```
}
```

Project Structure

- Separation of logical parts into own files
- Figures and listings into own folders
- Easy to rearrange and restructure

```
\input{sections/intro}  
\input{sections/fontsize}  
\input{sections/fontshape}  
\input{sections/numerations}  
\input{sections/images}  
\input{sections/tables}  
\input{sections/listings}
```

File `intro.tex` is imported



BIBTEX

Bibliographies for LaTeX

Bibliography

- Always underpin statements or claims with **citations**
- **Don't do it like Gutenberg or Schavan!**
- **BibTeX** extends LaTeX with **easy and reusable bibliographies**
 - Management of citations according to your citation style
 - E.g., [RWD+12] or [Reiman et al. 2012] or [1],[2]...
 - **Creation of bibliography** containing all citations of your LaTeX-document
 - **Excludes non-cited sources!**
- **Literature is stored in *.bib files**

Bibliography

```
@INPROCEEDINGS{Reimann2012a,  
  author = {Reimann, Jan and Wilke, Claas and Demuth,  
    Birgit and Muck, Michael and A\{ss}mann, Uwe},  
  title = {{Tool Supported OCL Refactoring Catalogue}},  
  booktitle = {Workshop on OCL and Textual Modelling  
    (OCL 2012)},  
  year = {2012}  
}
```

Citation in document: `\cite{Reimann2012a}`

Printing the bibliography: `\bibliographystyle{abbrv}`
%myBib.bib contains the entries
`\bibliography{myBib}`

Bibliography

- Different **types of entries** possible
- `@book` – Book
- `@inproceedings` – Conference paper
- `@article` – Journal article
- `@masterthesis` – Diploma and master theses
- ...
- `@misc` – Anything else

LATEX

Tools and Compiler

MikTeX

- **De-Facto Standard** LaTeX-**Compiler** for Windows
- <http://miktex.org/>
- Comes with: TexWorks
- There are others: TeXLive,...

TexWorks

- Combination of
 - simple LaTeX **editor**
 - LaTeX **compiler**
 - **PDF viewer**
- **No syntax highlighting**

```
energy4apps.tex - TeXworks
Datei Bearbeiten Suche Format Textsatz Skripte Fenster Hilfe
pdfLaTeX+MakeIndex+BibTeX
\documentclass[english]{lncs}
\iffileexists{latin1.sty}{\usepackage{latin1}}{\usepackage{isolatin1}}
\usepackage{graphicx}
\usepackage{color}
\usepackage{abbrevs}
\usepackage{multitrow}
\definecolor{gray}{rgb}{0.5,0.5,0.5}
\newcommand{\todo}[1]{\color{red}~\textbf{[TODO #1]}~\color{black}}
\newcommand{\todocp}[1]{\todo{Christian: #1}}
\newcommand{\todocw}[1]{\todo{Claas: #1}}
\newcommand{\todogp}[1]{\todo{Georg: #1}}
\newcommand{\todosg}[1]{\todo{SebG: #1}}
\newcommand{\todosr}[1]{\todo{SebR: #1}}
\newcommand{\lemp}{\textit}
\input{abbreviations}
\author{
  Claas Wilke, Sebastian Richly, Georg Püschel, Christian Piechnick, \
  Sebastian Götz, and Uwe Assmann \
  \
  Fakultät für Informatik, Institut für Software- und Medientechnik \
  Lehrstuhl Softwaretechnologie, Technische Universität Dresden \
  D-01062 Dresden \
  \{claas.wilke, sebastian.richly, georg.pueschel1, christian.piechnick, \
  uwe.assmann\}@tu-dresden.de, sebastian.goetz@acm.org
}
\title{Energy Labels for Mobile Applications}
\begin{document}
\maketitle
\begin{abstract}
In recent years the usage of mobile devices and the expansion of their
functionality by installing further applications have become very popular. Their
frequent usage causes much faster battery discharging, and thus drastically
limits the uptime of the devices and their applications. Hence, investigating
and reducing the power consumption of mobile applications is one of the
current, central challenges in software engineering. In this paper we propose
an approach for profiling the power consumption of mobile applications and
comparing their consumption for similar services. We show by example that such
differences can be identified for two well-known email clients. We envision a
repository or market place that allows users comparing and selecting
applications based on energy labels and their personal requirements.
\end{abstract}
%\todo{Deadline: 01.05.2012, Page limit: 15 pages}
\input{introduction}
\input{approach}
\input{profiling}
\input{relatedwork}
\input{conclusion}
\section*{Acknowledgements}
%\footnotesize
This research has been funded within the project ZESSY \#080951806, by the \ESF
and Federal State of Saxony and within the Collaborative Research Center 912
(HAEC), funded by the DFG. Furthermore, we thank Walteneus Dargle and his
team for providing the required power metering hardware, Doreen Fiss for her
assistance to statistically investigate our measurement results and the
reviewers of this paper for their very helpful and encouraging remarks.
\bibliography{energy4apps}
\end{document}
LF UTF-8 Zeile 1 von 70: Spalte 0
```

```
energy4apps.pdf - TeXworks
Datei Bearbeiten Suche Ansicht Textsatz Skripte Fenster Hilfe
Energy Labels for Mobile Applications
Claas Wilke, Sebastian Richly, Georg Püschel, Christian Piechnick,
Sebastian Götz, and Uwe Assmann
Fakultät Informatik, Institut für Software- und Medientechnik
Lehrstuhl Softwaretechnologie, Technische Universität Dresden
D-01062 Dresden
\{claas.wilke, sebastian.richly, georg.pueschel1, christian.piechnick,
uwe.assmann\}@tu-dresden.de, sebastian.goetz@acm.org
Abstract: In recent years the usage of mobile devices and the expansion of their
functionality by installing further applications have become very popular. Their frequent
usage causes much faster battery discharging, and thus drastically limits the uptime of
the devices and their applications. Hence, investigating and reducing the power consumption
of mobile applications is one of the current, central challenges in software
engineering. In this paper we propose an approach for profiling the power consumption
of mobile applications and comparing their consumption for similar services. We
show by example that such differences can be identified for two well-known email
clients. We envision a repository or market place that allows users comparing and
selecting applications based on energy labels and their personal requirements.
1 Introduction
Mobile devices, such as smart phones and tablets, have become very popular within the last
years. Nowadays, we use them regularly and everywhere, checking emails, appointments
or obtaining other content from the Internet. Besides the general usage of mobile devices,
adapting and extending their functionality with small, domain-specific applications (i.e.,
apps) has become a typical scenario. The extensive usage of mobile devices and their low
energy budgets, however, make power consumption of individual apps a major concern.
Often, devices consume so much energy that they run out of it within hours or a day.
Thus, investigating whether the power consumption of mobile devices can be decreased
by developing applications more intelligently or more resource-saving is a major research
challenge in software engineering. This is especially important for mobile applications
that are not only executed during direct user interaction but are running as background
services as well (e.g., to check email or news feed accounts for new incoming messages).
Thus, to increase the uptime of mobile devices, users should be able to base their
decision, which application they want to install, not only on the provided functionality and
the community's rating (e.g., a five star grading system as used in the Android market Google
Play), but also on an expectation of the application's power consumption during runtime.
To provide this information, we are working on a methodology that allows the comparison
SynTeX: "C:/Users/Claas Wilke/Documents/ST Projekte/Zessy2/EEbS2012_EnergyLabels/energy4apps.synctexi" 100% Seite 1 von 15
```

TeXnicCenter

- Extensive **LaTeX editor for Windows**
 - **Code Completion**
 - **Syntax Highlighting**
 - Integrated **BibTeX-Editor**
- <http://texniccenter.org/>

TeXlipse

- Extensive LaTeX editor for **Eclipse**
 - **Code Completion**
 - **Syntax Highlighting**
 - Integrated **BibTeX-Editor**
 - **Platform-independent**
- <http://texlipse.sourceforge.net/>

Package Explorer

- Other Projects
 - Diss
 - EEBS2012_EnergyLabels
 - figures
 - reviews
 - slides
 - submission
 - tmp
 - abbreviations.tex
 - approach.tex
 - conclusion.tex
 - energy4app.synctex.gz
 - energy4apps.aux
 - energy4apps.bib
 - energy4apps.log
 - energy4apps.pdf
 - energy4apps.tex
 - evaluation.tex
 - introduction.tex
 - latin1.sty
 - lni.bst
 - lni.cls
 - profiling.tex
 - relatedwork.tex
 - results.tex
 - Individual Research Leaflet Claas
 - org.emftext.commons.antr3_4_0
 - SEaGC2012
 - zessy
 - JouleUnit
 - JouleUnit 4 Eclipse
 - JouleUnit 4 Eclipse Experiments
 - NaoService
 - BA Herrlich

```

\author{
  Claas Wilke, Sebastian Richly, Georg P\uschel, Christian Piechnick, \
  Sebastian G\otz, and Uwe {A\ss}mann \
  \
  Fakult\at Informatik, Institut f\ur Software- und Multimediatechnik \
  Lehrstuhl Softwaretechnologie, Technische Universit\at Dresden \
  D-01062 Dresden \
  \{claas.wilke, sebastian.richly, georg.pueschell, christian.piechnick, \
  uwe.assmann\}@tu-dresden.de, sebastian.goetz@acm.org
}
\title{Energy Labels for Mobile Applications}
\begin{document}
\maketitle

\begin{abstract}
In recent years the usage of mobile devices and the expansion of their
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differences can be identified for two well-known email clients. We envision a
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applications based on energy labels and their personal requirements.
\end{abstract}

\todo{Deadline: 01.05.2012, Page limit: 15 pages}

\input{introduction}
\input{approach}
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\input{relatedwork}
\input{conclusion}

\section*{Acknowledgements}
\footnotesize
This research has been funded within the project ZESSY \#080951806, by the \ESF
and Federal State of Saxony and within the Collaborative Research Center 912
(HAEC), funded by the \DFG. Furthermore, we thank Waltenequs Dargie and his
team for providing the required power metering hardware, Doreen Fiss for her
assistance to statistically investigate our measurement results and the
reviewers of this paper for their very helpful and encouraging remarks.

\bibliography{energy4apps}

\end{document}

```

Outline

- Preamble
- Acknowledgements

Android

Sumatra

- **Lightweight PDF viewer** for Windows
- **No hard links** to open PDF files
- Document can be regenerated without closing it
- blog.kowalczyk.info/software/sumatrapdf/

JabRef

- **Reference manager** for BibTex
- **Platform-independent** (Java)
- <http://jabref.sourceforge.net/>



Search

hovedbase.bib* references.bib

Search All Fields
Clear

Incremental
 Float
 Filter

Settings

Groups

All Entries

- Cod
 - └ Ingestion
 - └ Energetics
 - └ Modelling
- Salmon
 - └ Modelling
- Rotifer
 - └ Modelling
 - └ Enrichment
 - └ Water quality
 - └ Resting eggs
- Kyb
- DHA
- Artemia
- Modelling
 - └ DEB
 - └ Assimilation
- Ciliates

Settings

#	Author	Title	Year	Journal	Timestamp
22	Anderson et al.	Metabolic stoichiometry and the fate of excess carbon and nutrients i...	2005	The American ...	2005.09...
23	Ando and Kobayashi	Positional distribution of docosahexaenoic acid in triacyl-sn-glycero...	2004	Aquaculture Re...	
24	Ando et al.	Positional distribution of n-3 highly unsaturated fatty acids in triacyl...	2004	Aquaculture	
25	Ang and Petrell	Pellet wastage, and subsurface and surface feeding behaviours associ...	1998	Aquacultural E...	
26	Anon.	Tall og fakta 2005. {S}tatistikkbilag til {FHL}s årsrapport	2005		2006.09...
27	Anras and Lagardère	Measuring cultured fish swimming behaviour: first results on rainbow...	2004	Aquaculture	
28	Aparici et al.	Sex allocation in haplodiploid cyclical parthenogens with density-de...	1998	American Natu...	2006.04...
29	Aragao et al.	Amino acid pools of rotifers and Artemia under different conditions: ...	2004	Aquaculture	
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